

ADDITIONAL NOTES ON TAIWAN PTERIDOPHYTES

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Volume One of the Flora of Taiwan which contains the treatment of the Pteridophytes of Taiwan was published in 1975, since that time a number of taxa have been found which were not included in Volume One, these are being reported here. In addition to these new records, we have found it necessary to make some other changes regarding a number of the taxa.

The two most interesting recent finds are *Acrostichum aureum* L. and *Diacalpe aspidioides* Blume since these are not only additions of previously unreported species but belong to genera new to Taiwan.

Acrostichum aureum L. has been long expected, since it is widely known in the tropics and in fact we have a few specimens in our herbarium without collection data which may have been collected on Taiwan but the discovery of *Diacalpe aspidioides* Blume came as a big surprise.

1. *Acrostichum aureum* L., Sp. Pl. 2: 1069. 1953. Copeland, Fern Fl. Philip. 1: 150. 1958; Holttum, Flora Malaya 2: 409. 1954; Beddome, Handb. Ferns Brit. India 440. 1883. 腎蕨

Widely distributed in the tropics, known in S.E. Asia from many places including the Philippines, Malaya, South China, Hainan, Hongkong, the Ryukyus and new to Taiwan.

Growing abundantly in brackish water in mangrove swamps or near the sea. The specimens collected in Pingtung County are smaller than those usually found, but the ones from Hualien compare favorably in size with fronds from other parts of the tropics. Those growing at Chiao-lou-shui in Pingtung County are growing near the shore but considerably above the high tide line. Those growing in Hualien County are a long ways from the sea.

HUALIEN: Fuli, C. W. Tsai s.n. Feb. 4, 1979

PINGTUNG: Chiao-lou-shui, Chiao 776, C. M. Kuo 9563, Ou & Kao 9030.

2. *Diacalpe aspidioides* Blume, Enum. Pl. Jav. 241. 1828; Holttum, Flora Malaya 2: 481. 1954; Copeland, Fern Fl. Philip. 2: 239. 1960; Beddome, Ferns So. India 85. pl. 257. 1863, reprint 1970; Beddome Handb. Ferns Brit. India 18. 1883. 紅線蕨

Distributed in Ceylon, India, Malaya, Vietnam, South China and the Philippines, new to Taiwan.

TAIWAN: W. L. Chiu in 1977.

Note: This fern was collected by a student, Wen-liang Chiu, who did not realize it was anything special and does not recall the exact locality or data when it was collected. It is to be hoped that it will soon be found again.

SEVEN ADDITIONAL SPECIES OF DRYOPTERIS

Mr. Yuan-Chuen Jeng has recently made a thorough investigation of the species of Dryopteris occurring on Taiwan and has written an unpublished Master's thesis entitled "A revision of Taiwan Dryopteris" (1978) in which he reports seven species not reported in Volume One of the Flora of Taiwan. These are as follows:

- (1) 棟蓆蕨, Professor of Botany Department, NTU.
 (2) 郭城孟, Teaching assistant of Botany Department, NTU.

1. *Dryopteris alpestris* Tagawa in Acta Phytotax. Geobot. 3: 88. 1934; Masamune, Short. Fl. Form. 12. 1936; Shieh in Journ. Sci. Eng. 12: 308. 1975. 腺鱗毛蕨
Distributed in Taiwan.
ILAN: Nanhutashan, *Jeng* 1973, *Hsu* 6005. HSINCHU: Tapachienshan, *Kuo*, 1774; NANTOU: Tashuikutashan *Ohwi* 3081 type, Hohuanshan, *Jeng* 1761, *Kuo* 423; TAICHUNG: Hsueshan, *Jeng* 1499; CHIAYI: Yushan, *Shieh et al.* 313, *Kuo* 1320.
2. *Dryopteris lacera* (Thunb.) O. Ktze., Reg. Gen. Pl. 2: 813. 1891; Ogata, Icon, Fil. Jap. 5. pl. 224. 1933; Ching in Bull. Fan Mem. Inst. Biol. 8: 439. 1938. 二型鱗毛蕨
Distributed in Mainland China, and Japan, and new to Taiwan.
ILAN: Nanhutashan, *Kuo* 508.
3. *Dryopteris marginata* (Wall.) Christ in Philip. Journ. Sci. 2: 212. 1907; Ching in Bull. Fan Mem. Inst. Biol. 8: 461. 1938; Tagawa in Acta Phytotax. Geobot. 8: 231. 1939; Shieh in Journ. Sci. Eng. 12: 308. 1975. 三角葉鱗毛蕨
Distributed in Northern India, China, Taiwan.
KAOHSIUNG: Laonong⁴ *Shieh & Chen* s. n. Aug. 20-30, 1968; PINGTUNG: Peitawushan, *Jeng* 2716; Tawushan, *S. Suzuki* s. n. Dec. 26, 1930.
4. *Dryopteris subintegriloba* Serizawa in Journ. Jap. Bot. 46: 17. f. 1-a; Shieh in Journ. Sci. Eng. 12: 312. 1975. 蓬萊紅苞鱗毛蕨
Distributed in Taiwan.
TAICHUNG: Shueishetashan, *S. Sasaki* s. n. Dec. 24, 1931. NANTOU: Lienhuachi, *Chen* 1257, Sun Moon Lake, *Serizawa* 1411 type; *Kudo* & *S. Sasaki* s. n. Sept. 18, 1929.
5. *Dryopteris taiwanicola* Tagawa in Acta Phytotax. Geobot. 8: 230. 1939; Masamune, A List Vasc. Pl. Taiwan 20. 1954; Shieh in Journ. Sci. Eng. 12: 307. 1975. 臺灣鱗毛蕨
Distributed in Taiwan.
ILAN: Tadrosheui, *Tsai* 2694. TAICHUNG: Lishan, *Jeng* 1767. NANTOU: Salishien, *Jeng* 2411; Yunhi to Tienchi, *Shieh et al.* s. n. Sept. 7, 1968. CHIAYI: Alishan, *Tagawa* 356 type; *Jeng* 2227; *Hayata & Sasaki* s. n. Jan. 1912. PINGTUNG: Peitawushan, *Jeng* 2713. TAITUNG: Shiangyangshan, *Jeng* 2643; Kuaiku to Yaku, *Shieh & Tsai* 1009.
6. *Dryopteris sublacera* Christ in Lecomte Not. Syst. 1: 43. 1909; Ching in Bull. Fan Mem. Inst. Biol. 8: 442. 1938. 亞二型鱗毛蕨
Distributed in Mainland China, new to Taiwan.
CHIAYI: Tatchia to Paiyun Hostel, *Jeng* 2349.
7. *Dryopteris yorii* Serizawa in Journ. Jap. Bot. 46: 20. 1971, *ibid* 49: 283. 1974. 上先型鱗毛蕨
Distributed in Taiwan.
HSINCHU: Mt. Shyoha, *Hashioka & Simada* 309. CHIAYI: Yushan, *R. Yoro* s. n. Aug. 1968. type. HUALIEN: Hohuanshan, *Kuo* 4284.

THE LYCOPODIUM COMPLANATUM COMPLEX

Lycopodium complanatum L. (sen. st.) is common in Europe, Alaska, Canada and the northern tier of states in U. S. A. also in Siberia, Korea and Japan but is not known from Taiwan, however there are four taxa of this complex found on Taiwan as recognized by Wilce (1965).

L. veitchii Christ was reported in the Flora of Taiwan (p. 35) and the so-called "China Plant" has not yet been properly named or described. The other two are listed here with their new names, together with a key, descriptions, locality records and Chinese names.

KEY TO THE SPECIES

1. Stolon long creeping on surface of ground; lateral branches widely spreading; vegetative leaves trimorphic, lower leaves of flattened branches smaller than dorsal ones, distantly spaced, tips not reaching the base of the leaf above it; ultimate branches 3–4.5 mm wide.....1. *L. multispicatum*
1. Rhizomes deeply buried in litter or soil; lateral branches closely appressed, directed upwards; vegetative leaves dimorphic, the lower leaves of flattened branches about the same size as the dorsal ones, tips reaching to the base of the leaf above it.....2. *L. wightianum*

1. *Lycopodium* (*Diphasium*) *multispicatum* Wilce in Nova Hedw. 3(1): 103. 1961, Monograph in Nova Hedw. Beih. 19: 148. 1965. pl. 1. 地刷子 Pl. 1

Lycopodium complanatum sensu DeVol in Fl. Taiwan 1: 18. 1975 *excl. pl., non L.*

Main stem a long creeping stolon, running on surface of the ground, terete, bearing isomorphic, linear-lanceolate, spiral leaves, these either with or without a decurrent base and averaging about 4 mm long. Erect aerial branches usually 12–20 cm tall, terete, forking from near the base, bearing spiral leaves similar to those on the creeping stolon. Lateral branches widely spreading, flattened, up to 3.0–4.5 mm wide, dichotomously branching. Leaves on the flattened branches scale-like, decussate, trimorphic, the lateral leaves similar in form, cuneate at base, the free tips acute, somewhat spreading or more often incurved; the dorsal leaves larger than the ventral and overlapping, while the ventral ones are rather distantly spaced. Fertile branches usually two; peduncles 11–15 cm long, leaves spirally arranged, lanceolate, bases usually not decurrent; pedicels 7–11 mm long; strobili usually 4–8 per peduncle, 18–30 mm long; sporophylls broadly ovate with a decurrent base, the tapering apex about 1/3 its total length; sporangia reniform.

Distribution: The Philippines (Luzon), Vietnam (Tonkin), Southeastern China and Taiwan.

ILAN: Taipingshan, Kao *et al.* 4462. HSINCHU: Tapachienshan, Kuoh 3820, Yang 15. NANTOU: Kuantaochi, Yang 142. CHIAYI: Mt. Alishan, Chao 129, DeVol 3388, Huang & Kao 1745, C. C. Hsu 6336, Kao 7486, Kuo 3232, S. Suzuki *s. n.* Jan. 26, 1922. KAOHSIUNG: Kuanshanakou, K. S. Hsu 1463. HUALIEN: Mukuashan, Kao 4138, Liu, Chen & Kao 256; Tayulin, Kao 8813.

2. *Lycopodium* (*Diphasium*) *wightianum* Wall., Cat. no. 2184. 1829; Hook. & Grev., Bot. Misc. 2: 379. 1831; Baker, Fern Allies 28. 1887; Wilce in Nova Hedw. Beih. 19: 128. 1965. 高山石松

Lycopodium alpinum var. *novoguineensis* Nessel in Fedde, Rep. Sp. Nov. 39: 65. 1936.

Lycopodium novoguineense (Nessel) Herter, Index Lycop. 30. 1949.

Lycopodium complanatum sensu DeVol in Fl. Taiwan 1: 39. pl. 6 only. 1975, non L.

Rhizome creeping, usually deeply buried beneath litter, bearing isomorphic, narrowly lanceolate, spirally arranged leaves. The erect branches terete, 2–14 cm long, wholly or partially buried in litter; leaves similar to those on rhizome. The lateral branches closely appressed, dichotomously forking, directed upwards, about 2 mm wide; ultimate branches indeterminate for two or three seasons, usually not forked. Leaves on flattened branches scale-like, decussate, decurrent, dimorphic; the lateral leaves acute, with tips slightly spreading or incurved; the ventral leaves of the same shape and almost same size as the dorsal leaves. Fertile branches usually one to three. Peduncles 6–14 cm long, simple or once forked, leaves spirally arranged

or nearly whorled, free blades 3–4 mm long. Pedicles 7–20 mm long. Strobili 1–3 per peduncle, 14–20 mm long.

Distribution: Tibet, India, Ceylon, Malaysia, Java, New Guinea (Papua) and Taiwan.

ILAN: Nanhutashan, *Sasaki s.n.* Oct. 31, 1928. TAICHUNG: Chika, *Huang 7072*; Hsinshan, *Huang 1295*; Sungling, *Sasaki s.n.* Oct. 10, 1930; Hsiaohsuehsan, *Liu et al. 309*. CHIAYI: Mt. Alishan, *Sasaki s.n.* Oct. 1928; Mt. Morrison, *S. Sasaki s.n.* Oct. 12, 1927; Yushanchiengshan, *C. C. Hsu 9177A*. TAITUNG: Ramaramashan, *Kao 6850*. HUALIEN: Chungyangchiengshan, *Fukuyama & Suzuki 15199*.

Note: The habit sketch of *L. complanatum* in the Flora of Taiwan Volume One on page 39, Pl. 6. is of *Lycopodium wightianum* Wall. but it needs to be pointed out that the artist did not observe that the leafy branch was not attached to the rhizome. This herbarium specimen from which the drawing was made (*Suzuki 15199* from Mukuashan in Hualien County) was mounted on the herbarium sheet to appear as if the leafy branch was attached to the rhizome, actually the rhizome is a separate distinct part. The rhizomes of this species usually grow deeply buried in litter and the leafy branch has a long erect underground stem which does not show in this drawing.

Figure 6 of Plate 6 in the Flora of Taiwan is evidently the enlarged view of the lateral branch of *L. multispicatum* and not of *L. wightianum*.

A NEWLY FOUND SELAGINELLA

1. *Selaginella uncinata* (Desv.) Spring, Monog. Fam. Lycop. II. 109. 1848; Baker in Journ. Bot. Br. For. 21: 143. 1883; Altson in Bull. Fan Mem. Inst. Biol. 5: 275. 1934; Makino, Ill. Fl. Nippon 969. fig. 1940; DeVol, Ferns East Central China 41. 1945. 翠雲草

Lycopodium uncinatum Desv. ex Poir. Encycl. Suppl. 3: 558. 1814.

Lycopodium dilatatum Hook. & Grev. in Hook. Bot. Misc. 2: 394. no. 149. 1831.

Main stem creeping, 15–45 cm long, rooting at base and at intervals; stem leaves distant, entire, dimorphic, one set ovate, nearly equal-sided, directed towards apex, the other set larger, unequal-sided, directed outwards; leafy branches borne at intervals, 3–12 cm long, all leaves imbricate, entire, with white margins; lateral leaves oblong, 2.2–2.5 mm long, acute; median leaves 1.2–1.5 mm long, very unequal-sided, cuspidate; axial leaf (best seen from underside) ovate, almost equal-sided; strobili 8–12 mm long, borne on ends of branchlets; sporophylls monomorphic, acuminate, keeled, 2.2–2.5 mm long.

Native of China, now widely cultivated in many parts of the world, probably introduced to Taiwan.

TAIPEI: Huakang, *Kuo 7038*.

THE DIPLAZIUM VIRESCENS COMPLEX

The four ferns belonging to the *Diplazium virescens* complex are very similar to each other. Their fronds grow to be about one meter tall. The scales at the base of the stipe are brownish-black, narrowly linear-lanceolate, and have margins with minutely protruding teeth. Fronds are bipinnate and the pinnules range from being shallowly to deeply cut, i. e. cut more than half way to base. The indusia resemble those of *Diplaziopsis*, except that they are very short, being only 1–3 mm long, and break open very irregularly. In the Flora of Taiwan the one name *D. virescens* is used for all these taxa.

KEY TO THE SPECIES OF THE DIPLAZIUM VIRESCENS COMPLEX

1. Base of pinnules cuneate, stalk prominent 3. *D. taiwanense*
 1. Base of pinnules truncate, parallel with costa of pinna.
 2. Sori borne nearly midway between margin and midvein of the ultimate segmen... 4. *D. virescens*
 2. Sori not medial, being either costal or marginal
 3. Sori borne near the margin of pinnule lobes 1. *D. conterminum*
 3. Sori borne near base of pinnule lobes 2. *D. okinawaense*
1. **Diplazium conterminum** Christ in Journ. de Bot. 19: 67. 1905; Wu, Wong & Pong in Bull. Dept. Biol. Coll. Sci. Sun Yat-sen Univ. 3: 166. pl. 78. 1932. 邊生短腸蕨 Pl. 2
Allantodia contermina (Christ) Ching in Acta Phytotax. Sin. 9(1): 47. 1964.
Diplazium allantodioides Ching in Bull. Fan. Mem. Inst. Biol. 2: 203. pl. 8, 19. 1931.
 Distribution in South China, Vietnam and Taiwan.
 HSINCHU: Chutung, T. Suzuki 20324, 20385.
2. **Diplazium okinawaense** Tagawa in Acta Phytotax. Geobot. 2: 199. 1933; *ibid.* 9: 90. 1940. 琉球雙蓋蕨
Diplazium virescens Kunze var. *okinawaense* (Tagawa) Kurata in Hokuriku Journ. Bot. 7: 77. 1958; Ohmura in Hokuriku Journ. Bot. 7: pl. 32. 1958; Tagawa, Col. III. Jap. Pterid. 138, 203. 1959; Shieh in Journ. Sci. Eng. 13: 62. 1976.
 Distribution in Southern Japan and Taiwan.
 TAIPEI: Tatunshan, C. M. Kuo 10356.
3. **Diplazium taiwanense** Tagawa in Acta Phytotax. Geobot. 5: 259. 1936; Tagawa, Col. III. Jap. Pterid. 138, 208. pl. 56. f. 306. 1959; Masamune, List. Vasc. Pl. Taiwan 14. 1954; Shieh in Journ. Sci. Eng. 13: 62. 1976. 臺灣雙蓋蕨
Allantodia taiwanensis (Tagawa) Ching in Acta Phytotax. Sin. 9(1): 53. 1964.
 Distributed in Taiwan and Southern Japan.
 TAIPEI: Chihshingshan, C. M. Kuo 5528, DeVol, Feung & Kao 4458; Sosan S. Suzuki s. n. Aug. 26, 1938; Keelung, I. Simozawa 371.
4. **Diplazium virescens** Kunze in Bot. Zeit. 6: 537. 1848; Tagawa in Acta Phytotax. Geobot. 7: 184. 1938; Tagawa, Col. III. Jap. Pterid. 138, 203. pl. 56. f. 307. 1959; Masamune, List Vasc. Pl. Taiwan. 14. 1954; Shieh in Journ. Sci. Eng. 13. 62. 1976. 刺鱗雙蓋蕨
Diplazium kappanense Hayata, Icon. Pl. Form. 8: 143. f. 69, 70. 1979.
 Distributed in South China, Vietnam, Taiwan and Japan.
 TAIWAN: U. Faurie 8187.

Note: When the junior author was going through the herbarium specimens of the National Taiwan University Herbarium he discovered that our materials could be divided into four taxa, and so no matter whether these four taxa are considered distinct species or only varieties of one species, it is evident that there is one taxon which has not been previously reported, which is *Diplazium conterminum* Christ. Then when the junior author was studying the literature relating to this group of ferns he discovered that *D. kappanense* Hayata, which was described in 1919 is one and the same species as *D. virescens* Kunze, so *D. kappanense* is being reduced to be a synonym of *D. virescens*.

Up to the time of the publication of Masamune's Short Flora of Formosa (1936) the ferns

in the *D. virescens* complex were all known as *D. kappanense*. Then in 1936 Tagawa described a new species *D. taiwanense*. In 1938 Tagawa stated in his paper on distributional notes that *D. virescens* was found in Taiwan, again in 1940 he reported the presence of *D. okinawaense* on Taiwan.

Masamune's mimeographed check list of 1954 lists *D. taiwanense*, *D. okinawaense* and *D. virescens* but makes no mention of *D. kappanense*.

Hsieh and Yang in the Nomen. of Pl. in Taiwan (1969) only mention *D. kappanense* and *D. virescens*.

In 1969 Shieh in his Ferns and Fern Allies (p. 117-118) lists four species and this is the most complete listing of these ferns, but in 1972 Shieh in 中山自然科學大辭典 pages 584-585 only mentions *D. taiwanense* and *D. virescens*. In Yang 1973 in his List of Plants in Taiwan omitted *D. virescens* but listed the other three. In 1975 DeVol and Kuo in the Flora of Taiwan Volume One only used the one name: *D. virescens*. Finally in 1976 Shieh listed 3 of the taxa (Journ. Sci. & Eng. 13: 62) but omitted *D. kappanense*. Thus it is seen that there has been a lot of confusion regarding the taxonomy and nomenclature of this group of ferns.

THREE OVERLOOKED SPECIES

Mr. Chen-Che Wang made a study of the genus *Polystichum* and wrote a Master's Thesis on the subject "A Revision of *Polystichum* in Taiwan" (1978) which has not yet been published, in which he reports the following species which was not previously known from Taiwan.

1. *Polystichum inaense* (Tagawa) Tagawa in Journ. Jap. Bot. 14: 709. 1938; Tagawa, Col. III. Jap. Pterid. 80. pl. 25. f. 149, 247. 1963; Ohwi, Fl. Jap. Pterid. 63. 1957. Daigobo in Sci. Rep. Tokyo Kyoiku Daigobo Sec. B. 15: 65. 1972. 小耳蕨

Dryopteris inaense Tagawa in Acta Phytotax. Geobot. 3: 90. 1935.

Distributed in Japan (Honshu) and a new record for Taiwan. A rare fern growing in alpine regions.

TAITUNG: Shiangyangshan, Wang 2090.

2. *Pteris ryukyuensis* Tagawa in Acta Phytotax. Geobot. 4: 204. 1935; R. Sho, Miscellaneous notes on the fern flora of Formosa I. fig. 1. 1945; H. Ito, Fil. Jap. Ill. r. 41. 1944; Shieh in Bot. Mag. Tokyo 79: 286. 1966; Hatusima, Fl. Ryukyus 159. 1971; Walker, Fl. Okinawa South. Ryukyu Isl. 63. 1976. 琉球鳳尾蕨

Distributed in the Ryukyu Islands and Taiwan.

TAIPEI: Changchushan, DeVol 8357; Wutzushan, Liew s. n. Growing in ravines at low altitudes.

Note: This species was first collected on Taiwan by R. Sho near Chutong in Hsinchu County and reported in a mimeographed paper entitled "Miscellaneous Notes on the Fern Flora of Formosa" (1945). We do not have any of his specimens in our herbarium and very few copies of his paper are left.

This species is very near *P. multifida* Poir. but differs in its wingless rachis.

3. *Lindsaea obtusa* J. Sm. in Hook., Sp. Fil. 1: 224. 1846. Kramer in Fl. Males II. 1(3): 218. 1971. 南洋膜齒蕨

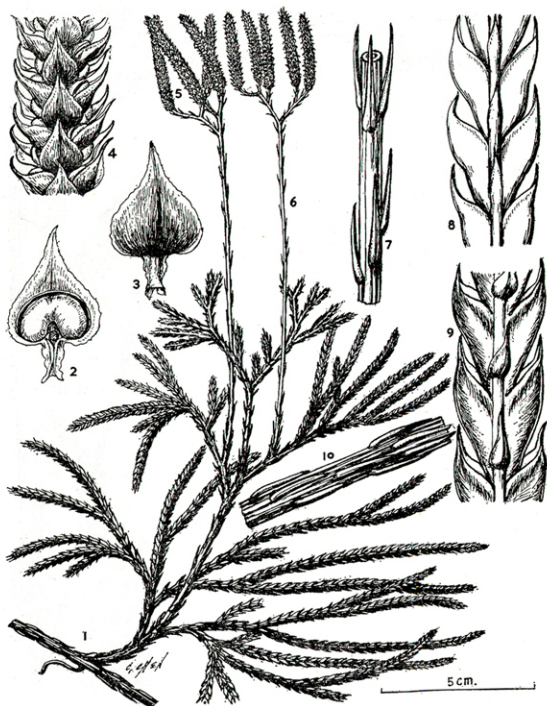
Lindsaea davallioides auct. non Blume, Holtt. Rev. Fl. Mal. 2: 322. f. 190. 1954.

Distributed throughout Malesia being found on many island from Taiwan to Micronesia

and Australia.

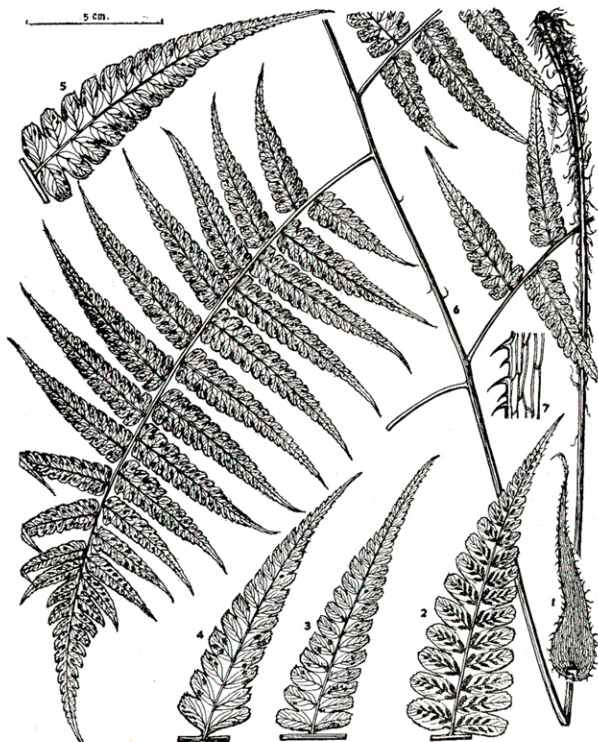
TAIPEI: Kankou, *Nakamura* 4198; *S. Sasaki* s. n. Aug. 12, 1930; *Simozawa* s. n. Nov. 3, 1934. TAICHUNG: Pahsienshan, *S. Suzuki* s. n. Oct. 22, 1929. PINGTUNG: Nanjenshan, *C. C. Hsu* 8279. TAITUNG: Changyen, *T. Suzuki* 19689; Suka, *Simozawa* s. n. Jan. 3, 1938.

Note: This species was unintentionally omitted from the Flora of Taiwan.



Pl. 1. *Lycopodium multispicatum* Wilce

1. habit; 2. lower view of sporophyll, showing reniform sporangium; 3. dorsal view of sporophyll; 4. portion of strobilus; 5. pedicel; 6. peduncle; 7. enlarged view of peduncle and its leaves; 8. dorsal view of leafy branch; 9. ventral view of leafy branch; 10. enlarged view of stolon.



Pl. 2. *Diplazium conterminum* Christ

1. scale from base of stipe; 2. pinnule from lower pinna of *D. okinawaense*; 3. pinnule from lower pinna of *D. vireseens*; 4. pinnule from lower pinna of *D. taiwanense*; 5. pinnule from lower pinna of *D. conterminum*; 6. habit sketch of *D. conterminum*; 7. margin of stipe scale.